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Shenzhen TOPA Tech Co., Ltd.

深圳市特派科技有限公司

Specification For Approval

客户承认书

|                              |                  |
|------------------------------|------------------|
| Customer Name Code<br>客户名称代码 |                  |
| Model<br>产品型号                |                  |
| Description<br>规格描述          | 16S2P-51.2V104Ah |
| Effective Date<br>生效日期       | 2022年09月26日      |

| Made By<br>制订 | Checked By<br>审核 | Approved By<br>批准 |
|---------------|------------------|-------------------|
|               |                  |                   |

|                                  |                        |
|----------------------------------|------------------------|
| Customer<br>Confirmation<br>客户确认 | Company Name<br>公司名称:  |
|                                  | Signature<br>签名:       |
|                                  | Company Stamp<br>公司印章: |

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## 1、Scope of application documents/文件适用范围

The specification of this product is only applicable to the protection parameters of a rechargeable lithium-ion battery Product and cell designed by Shenzhen TOPA Tech Co., Ltd.

本产品规格书仅适用由深圳市特派科技有限公司设计的可充电锂离子电池产品和电芯的保护参数。

## 2、The Specification Amendment/ 规格书修订

If the raw materials, production processing, production system or battery usage environments & other conditions need to be changed, the amendment side needs provide the written advice to the other side, only the both sides come to agreement, the amendment will be effective.

如因原材料、生产制程、生产系统或电池使用环境或其他条件发生改变，修订方需将改变的信息以书面形式通知对方取得供需双方同意后再行修订。

## 3、Product or Cell testing conditions/ 设备产品或电芯的测试条件

It is recommended to use newly produced battery packs and new cells for related tests. Unless specified, testing and measurement shall be done under temperature of  $20\pm 5^{\circ}\text{C}$  and relative humidity of 45~75%.

建议采用新生产的电池组和新的电芯作相关的测试。除非有特别要求，否则测试需要在温度  $20\pm 5^{\circ}\text{C}$ ，相对湿度 45~75%的条件下进行。

## 4、Standard / 标准

### 4.1 Reference Standard/参考标准

参考 GB 31241-2014 便携式电子产品用锂离子电池和电池组安全要求

参考 UL1642 安全标准-(锂电池)

### 4.2 Measuring Instrument and Apparatus/ 测量器具及设备

#### 4.2.1 Dimension Measuring Instrument/ 尺寸测量器具

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.02mm. 尺寸测量器具的精度等级应不小于 0.02 mm。

#### 4.2.2 Voltmeter (伏特计)

Standard class specified in the national standard or more sensitive class having inner impedance more than  $10\text{k}\Omega/\text{V}$ . 按照国家标准指定规格等级或采用灵敏度更高的，测量电压时内阻不应小于  $10\text{k}\Omega/\text{V}$ 。

#### 4.2.3 Ammeter (安培计)

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than  $0.01\Omega$ . 按照国家标准指定规格等级或采用灵敏度更高的，包括电流表及电线在内的总外阻应小于  $0.01\Omega$ 。

#### 4.2.4 Impedance Meter (电阻计)

Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter). 内阻测

试仪测量原理应为交流阻抗法（1kHz LCR）。

4.3 Testing Conditions 测试条件 (Unless Specially Requirements) (除非特别规定)

Atmosphere Pressure : 86~106kPa      大气压力: 86~106kPa

Temperature: 20°C ±5°C                      环境温度: 20°C ±5°C

Relative Humidity: ≤75%                      环境湿度: ≤75%

5. Main specifications 主要技术参数

5.1 Cell Battery specifications 电芯技术参数

| No | Item 项目  | General Parameter<br>常规参数  |       | Remark 备注  |
|----|--|--|-------|--|
|    |  |  |       |  |
| 1  | Rated Capacity<br>额定容量                         | Typical  | 104Ah | 0.2C Standard Discharging  |
|    |  | Minimum  | 100Ah | 0.2C 标准放电  |
| 2  | Nominal Voltage<br>平台电压                        | 3.2V   |       | Mean Operation Voltage<br>平台电压   |
| 3  | Internal Impedance<br>内阻                       | ≤0.45 mΩ   |       | Under 20±5°C Environment Temperature ,<br>the Usage Frequency of Fully<br>Charge( 1KHz) , Use AC Internal Impedance<br>test machine to test 20±5°C.<br><br>环境温度下, 完全充电后使用频率为 (1kHz)<br>的交流内阻测试仪测量。 |
| 4  | Standard charge<br>标准充电                        | Constant Current:<br>0.2C<br>Constant Voltage:<br>3.65V<br>0.05C_10.0A cut-off |       | Charge time : Approx2.5h<br>充电时间:约 2.5 小时  |
| 5  | Rapid Charge<br>快速充电                           | Constant Current:<br>0.5C<br>Constant Voltage:<br>3.65V<br>0.05C 10.0A cut-off |       |  |
| 6  | Standard Charge<br>Cut-off Voltage<br>标准充电截止电压 | 3.65V  |       | Voltage of the battery when the Charge<br>is stopped.<br><br>按电芯充电达到满电时停止的电压值。   |
| 7  | Standard Discharge                             | 2.5V   |       | Voltage of the battery when the  |

|    |                                       |  |   |
|----|---------------------------------------|--|---|
|    | Cut-off Voltage<br>标准放电截止电压           |  | discharge is stopped.<br>按电芯平台放电达到放电截止的电压值。   |
| 8  | Standard discharge current<br>标准放电电流  | Constant current:<br>0.2C<br>end voltage 2.5V  |   |
| 9  | Maximum discharge current<br>最大放电持续电流 | Constant current:<br>1C<br>end voltage: 2.5V   | 100A@ $\cong 0^{\circ}\text{C}$   |
| 10 | Dimension<br>尺寸                       | Thickness/厚度:<br>52.3 $\pm$ 0.5mm  | Initial Dimension<br>(初始尺寸)   |
|    |                                       | Width/宽度:<br>148.2 $\pm$ 0.5mm   |   |
|    |                                       | Height/高度:<br>119.0 $\pm$ 0.5mm  |   |
| 11 | Weight 重量                             | 1.94 $\pm$ 0.1kg   |   |
| 12 | Operating Temperature Range<br>工作温度范围 | Temperature:-20 $\sim$ 55 $^{\circ}\text{C}$<br>Humidity: $\leq$ 85%RH<br>温度: -20 $\sim$ 55 $^{\circ}\text{C}$<br>相对湿度: $\leq$ 85% | Recommended charge/discharge current $\leq$ 1.0C, when cell temperature is lower than 0 $^{\circ}\text{C}$ , Recommended cool the cell, when cell temperature is higher than 55 $^{\circ}\text{C}$ .<br>建议充放电电流 $\leq$ 1C, 当电池温度低于 0 $^{\circ}\text{C}$ 时, 当电池温度高于 55 $^{\circ}\text{C}$ 时建议冷却电池。 |
| 13 | Storage Temperature Range<br>储存温度范围   | -20 $^{\circ}\text{C}$ $\sim$ 45 $^{\circ}\text{C}$  | Recommend ( 25 $\pm$ 3 $^{\circ}\text{C}$ ) ;<br>$\leq$ 90%RH storage moisture range.<br>推荐储存湿度范围 $\leq$ 90%RH  |

## 5.2 Battery Pack specifications (电池组技术参数)

| No | Item 项目                                   | General Parameter                            |       | Remark 备注   |
|----|---|--|-------|---|
| 1  | Combination method                        | 16S1P  |       |   |
| 2  | Rated Capacity<br>额定容量                    | Typical                                      | 104Ah | Standard discharge after Standard charge (package)<br>标准充电后标准放电   |
|    |   | Minimum                                      | 100Ah |   |
| 3  | Factory Voltage<br>出厂电压                   | 51.2V-53.6V                                  |       | Mean Operation Voltage<br>即工作电压   |
| 4  | Voltage at end of Discharge<br>放电终止电压     | 46.4V  |       | Discharge Cut-off Voltage<br>放电截止电压   |
| 5  | Charging Voltage<br>充电电压                  | 56.8V  |       |   |
| 6  | Internal Impedance<br>内阻                  | $\leq 100\text{m}\Omega$                     |       | Under $20\pm 5^{\circ}\text{C}$ Environment Temperature , the Usage Frequency of Fully Charge( 1KHz) , Use AC Internal Impedance test machine to test $20\pm 5^{\circ}\text{C}$ .<br>环境温度下, 完全充电后使用频率为 (1kHz) 的交流内阻测试仪测量。 |
| 7  | Max Charging Current (Icm)<br>允许最大充电电流    | 50A  |       | Ampere-meter , Maximum allowable charging current of the battery pack.<br>电流表测量, 电池组最大充电电流。   |
| 8  | Limited Charging Voltage (Ucl)<br>充电限制电压  | 56.8V  |       | Volta-meter (Serial*3.55V) , Battery pack safe charging voltage.<br>电压表测量 (串数*3.55V (电芯的安全充电电压)), 电池组安全充电电压。  |
| 9  | Max Discharging current<br>最大放电电流         | 100A   |       | Maximum discharge current allowed by the battery pack. 允许用最大放电电流进行放电。   |
| 10 | Discharge Cut-off voltage (Udo)<br>放电截止电压 | 46.4V  |       | Voltage of the battery when the discharge is stopped.<br>为电池组中止放电的负载电压 (按电芯平台放电达到放电截止的电压值)。   |
| 11 | Operation Temperature Range<br>工作温度范围     | Charg: $0\sim 55^{\circ}\text{C}$            |       |   |
|    |   | Discharge: $-20\sim 55^{\circ}\text{C}$      |       |   |
| 12 | Storage Temperature Range<br>储存温度范围       | $-20^{\circ}\text{C}\sim 45^{\circ}\text{C}$ |       | Recommend ( $25\pm 3^{\circ}\text{C}$ ) ; $\leq 90\%RH$ storage moisture range.<br>推荐 $\leq 90\%RH$ 储存湿度范围。   |
| 13 | Single module size<br>单模组尺寸               | 650*560*200mm                                |       | 1PCS  |
| 14 | Main control box size<br>主控箱尺寸            | /  |       | /   |
| 15 | Battery cluster size<br>电池组尺寸             | /  |       | /   |
| 16 | Full Weight<br>全重量                        | 55kg $\pm$ 1kg                               |       | Include case 包含包装   |

### 5.3. Battery Management System 电池管理系统规范

#### 5.3.1 BMS function introduction (BMS 功能介绍)

- .1 overcharge detection function (过充电保护功能)
- .2 over discharge detection function (过放电保护功能)
- .3 over current detection function (过电流保护功能)
- .4 short detection function (短路保护功能)
- .5 Temperature detection function 温度保护功能

#### 5.3.2 BMS Protect parameter (电池管理系统保护参数)

| 项目 Items  | 明细 Details   | 标准 Standard                         |
|---|--|-------------------------------------|
| Cell overcharge protection<br>电池过充电保护   | Overcharge detection voltage<br>过充电检测电压                    | 3.65±0.05V                          |
|   | Overcharge detection delay time<br>过充电检测延迟时间               | Typical:1.0s                        |
|   | Overcharge release voltage<br>过充电释放电压                      | 3.55±0.05V                          |
| Cell over-discharge protection<br>电池过放电保护   | Over-discharge detection voltage<br>过放电检测电压                | 2.5±0.1V                            |
|   | Over-discharge detection delay time<br>过放电检测延迟时间           | Typical:1.0s                        |
|   | Over-discharge release voltage<br>过放电释放电压                  | 2.7±0.1V or charging release (充电释放) |
| Over-current protection<br>过流保护   | discharge Over-current protection current<br>放电过放电保护电流     | 150A±10A                            |
|   | discharge Over-current detection delay time<br>放电过电流检测延迟时间 | 1S                                  |
| Short protection<br>短路保护  | Protection condition<br>保护条件                               | Load short 短路                       |
|   | Protection release condition<br>保护释放条件                     | Charging release 充电释放               |
| Temperature(T) protection<br>温度保护   | Charge high T protection<br>充电高温保护                         | 60±3℃                               |
|   | Charge high T recover<br>充电高温恢复                            | 50±5℃                               |
|   | Discharge high T protection<br>放电高温保护                      | 65±5℃                               |
|   | Discharge high T recover<br>放电高温恢复                         | 60±5℃                               |
| It has CAN and RS485 standard communication interface, it real-time monitoring the capacity of battery bank, the voltage, current, environment temperature, and charging/discharging current, |  |                                     |

|               |  |
|---------------|--|
| Communication | RS485, CAN, Baud rate:19200Kps,<br>RS485 COMMON:Master address:CODE1, slave address:2~15 any number.<br>具有 CAN 和 RS 485 标准通讯接口, 可实时监测蓄电池组容量、电压、电流、<br>环境温度、充放电电流等, |
| 通讯            | 485 总线, CAN 总线, 波特率: 19200Kps<br>主地址: 代码1。从地址: 2~15任意数字。   |

## 6. Appearance and structural dimensions 外观结构尺寸

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt. The structure and dimensions see attached drawing of the product.

电池的表面应无明显的划痕毛刺及其其它机械划伤, 外露的金属端子应无锈蚀污垢。

### 6.1 Main control box 外观

| Unit 单位 (mm) |                                |           |     |        |        |
|--------------|--------------------------------|-----------|-----|--------|--------|
| T (厚度)       | 200                            | W(宽度)     | 560 | H (高度) | 650    |
| L(外露线长)      | /                              | WIRE (引线) | /   | 端子型号   | 6mm 插头 |
| 备注           | 输出线: 25mm <sup>2</sup> , 长度 2m |           |     |        |        |

| No. | Description                    | Silk-screen | Remark |
|-----|--------------------------------|-------------|--------|
| 1   | Breakr<br>开关                   | BREAKER     | ①      |
| 2   | Slave battery positive<br>模组正极 | “+”         | ②      |
| 3   | Rest Switch<br>复位开关            | RST         | ③      |
| 4   | Address code<br>地址码            | ADD         | ④      |
| 5   | Communication port<br>通讯口      | CAN,RS485   | ⑤      |
| 6   | Communication port<br>通讯口      | RS485*2     | ⑥      |
| 7   | Slave battery negative<br>模组负极 | “-”         | ⑦      |
| 8   | 电源开关<br>Power Switch           | ON/OFF      | ⑧      |
| 9   | 显示屏<br>LCD                     |             | ⑨      |
| 10  | 电量<br>SOC                      | SOC,ALM/RUN | ⑩      |

## 7. Storage and Others 贮存及其它事项

### 7.1 Long Time Storage 长期贮存

If stored for a long time(don' t used, exceed three months), the cell should be stored in drying and cooling place. The cell' s storage voltage should be 51.2V-53.6V and the cell is to be stored in a condition that the temperature of  $23\pm 2^{\circ}\text{C}$  and the humidity of 45%-75%. Long-term use of unused batteries to recharge every 3 months. Ensure that the battery voltage is within the above range.

长期贮存的电池（未使用, 超过 3 个月）须置于干燥、凉爽处。贮存电压为 51.2V-53.6V。储存于  $23\pm 2^{\circ}\text{C}$ ，湿度为 45%-75% 的洁净环境。长期搁置未使用电池每 3 个月补电一次，确保电池电压在上述范围内。

## 8. Appendix（附录）

### Handling Precautions and Guideline For Li-ion Rechargeable Batteries

#### 锂离子充电电池操作指示及注意事项

##### Preface 前言

This document of 'Handling Precautions and Guideline Li-ion Rechargeable Batteries' shall be applied to the battery cells manufactured by Shenzhen TOPA Tech Co., Ltd.

本檔“锂离子充电电池操作指示及注意事项”仅适用于深圳市特派科技有限公司生产电池。

### **Note (1) : 声明**

The customer is requested to contact Shenzhen TOPA Tech Co., Ltd. in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

客户若需要将电池用于超出本规格书规定以外的设备, 或在本规格书规定以外的使用条件下使用电池, 应事先联系深圳市特派科技有限公司, 因为需要进行特定的实验测试以核实电池在该使用条件下的性能及安全性。

### **Note (2) : 声明二**

Shenzhen TOPA Tech Co., Ltd. will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

对于在超出本规格书规定以外的条件下使用电池而造成的任何意外事故, 深圳市特派科技有限公司概不负责。

### **Note (3): 声明三**

Shenzhen TOPA Tech Co., Ltd. will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.

如有必要, 深圳市特派科技有限公司会以书面形式告知客户有关正确操作使用电池的改进措施。

### **Danger!**

### **危 险!**

- Do not immerse the battery in water or allow it to get wet.
- 勿将电池投入水中或将其弄湿!
- Do not use or store the battery near sources of heat such as a fire or heater. If the battery leaks or emits peculiar smell, it shall be removed from the place close to the open fire immediately.
- 禁止在火源或极热条件下给电池充电! 勿在热源(如火或加热器)附近使用或贮存电池! 如果电池泄漏或发出异味, 应立即将其从接近明火处移开;
- Do not use any chargers other than those recommended by Shenzhen TOPA Tech Co., Ltd!
- 请勿使用深圳市特派科技有限公司推荐的充电器以外的任何充电器!
- Do not reverse the positive(+) and negative(-) terminals.
- 勿将正负极接反!
- Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
- 勿将电池直接连接到墙上插座或车载点烟式插座上!
- Do not put the battery into a fire or apply direct heat to it.
- 勿将电池投入火中或给电池加热!
- Do not short-circuit the battery by connecting wires or other metal objects to the positive(+) and

negative(-) terminals.

- 禁止用导线或其它金属物体将电池正负极短路，禁止将电池与项链、发夹或其它金属物体一起运输或贮存！
- Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
- 禁止用钉子或其它尖锐物体刺穿电池壳体，禁止锤击或脚踏电池！
- Do not strike, throw or subject the battery to sever physical shock.
- 禁止撞击、投掷或者使电池受到机械震动
- Do not directly solder the battery terminals.
- 禁止直接焊接电池端子！
- Do not attempt to disassemble or modify the battery in any way.
- 禁止以任何方式分解电池！
- Do not place the battery in a microwave oven or pressurized container.
- 禁止将电池置入微波炉或压力容器中！
- Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries of different capacity, type or brand.
- 禁止与一次电池（如干电池）或不同容量、型号、品种电池组合使用！
- Do not use the battery if it gives off an odor, generates heat, becomes discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.
- 如果电池发出异味、发热、变形、变色或出现其它任何异常现象时不得使用；如果电池正在使用或充电，应立即从用电器中或充电器上取出并停止使用！

#### **Caution!**

#### **注 意！**

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

不要使用处于极热环境中的电池，如阳光直射或热天的车内。否则，电池会过热，可能着火（点燃），这样就会影响电池的性能、缩短电池的使用寿命。

If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.

如果电池漏液后电解液进入眼睛，不要擦，应用水冲洗，立即寻求医疗救助。如不及时处理，眼睛将会受到伤

害。